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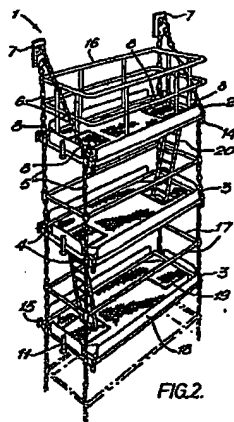
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(54) Suspended staging: escape apparatus

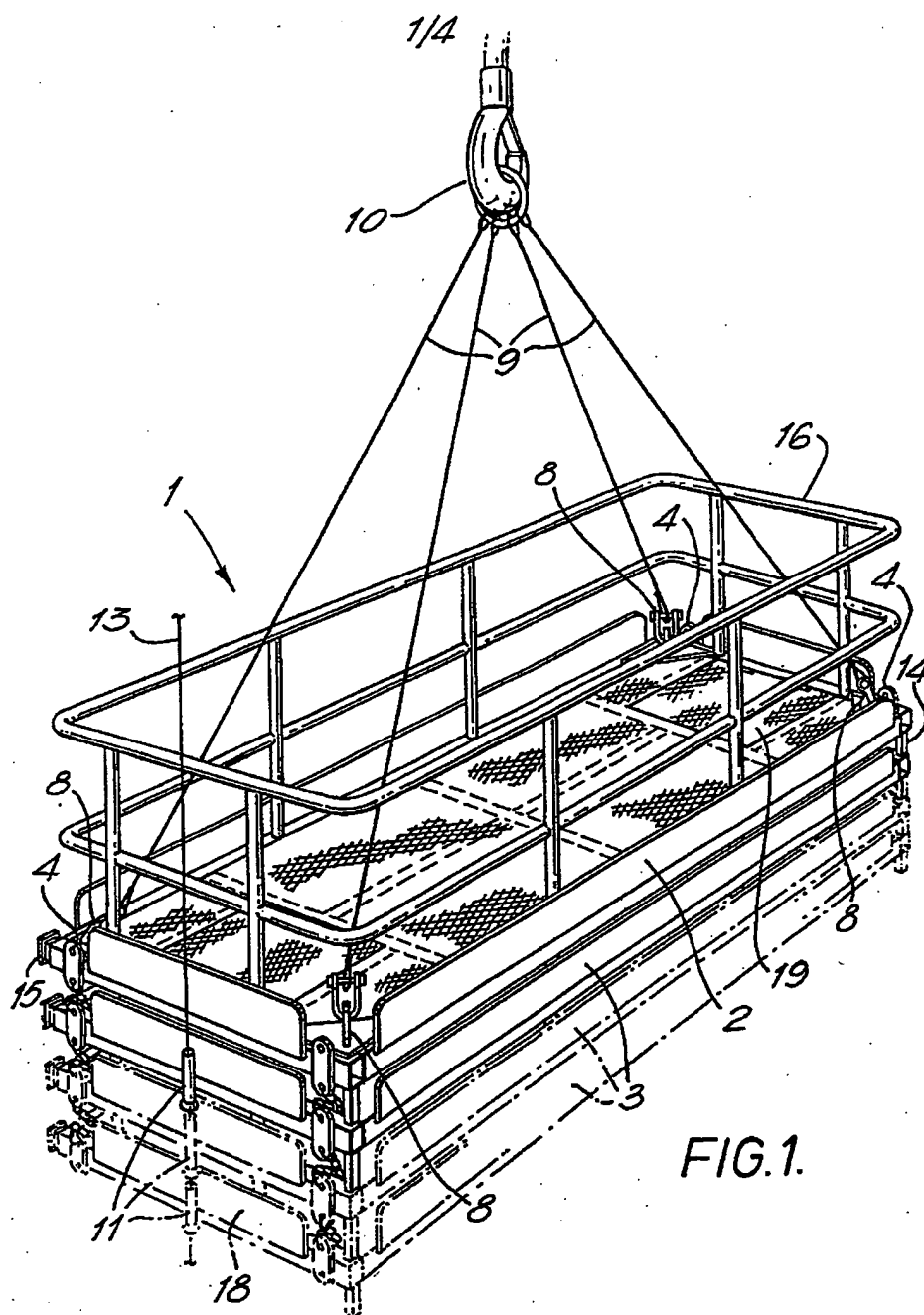
(57) A suspended staging system 1 comprising a series of platforms 2, 3 each connected to the platform above it by means of separate flexible elongate elements 5 connected to corresponding link plates 4 on adjacent platforms. Separate attachment means 8 are provided whereby the staging can be suspended by a crane independently of the link plates 4 on the top platform 2 used for permanent fixing to fixed points 7 on a surface. Each platform has a hatch 19 and a ladder 20 suspended below it, the ladder being mounted so that its lateral position is adjustable to ensure that the ladder can safely overhang the adjacent platform below it even when the staging is supported against an inclined surface e.g. the side of a vessel. The ladder is slidably mounted at the head on a rod, and has a roller at the foot, so that, upon collapse, the ladder lies between the platforms. When used as an escape, sheathing may surround the stack of platforms, and a water sprinkler system may be provided for cooling the immediate atmosphere and/or sheathing.



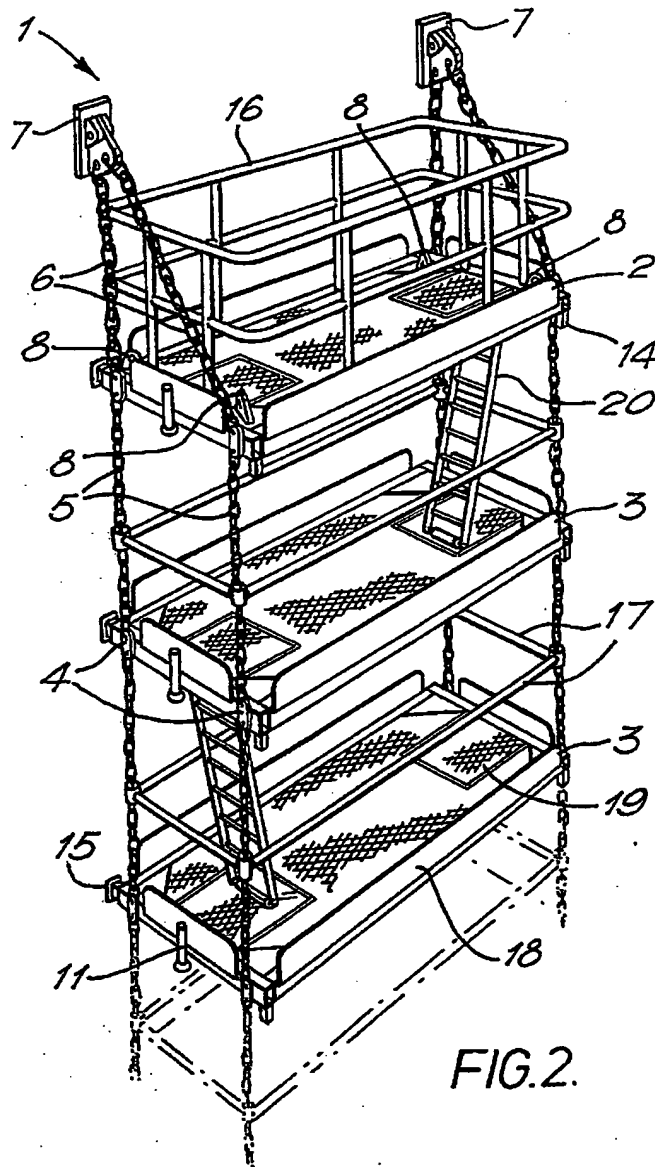
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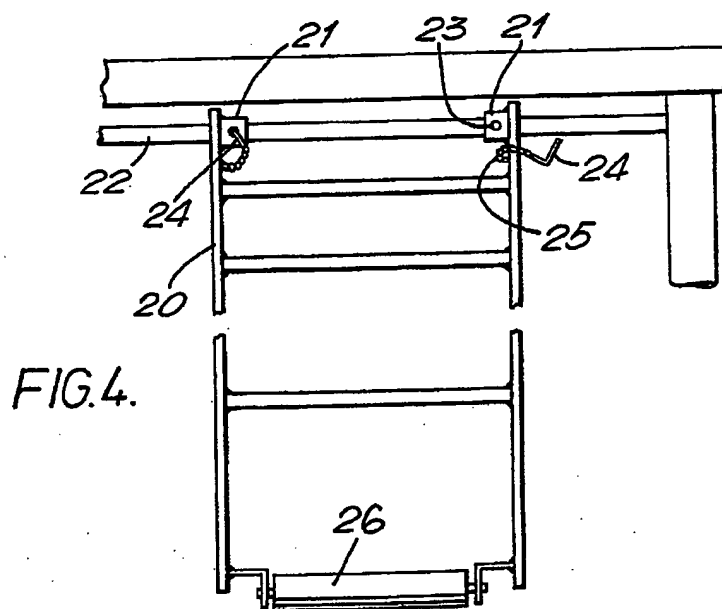
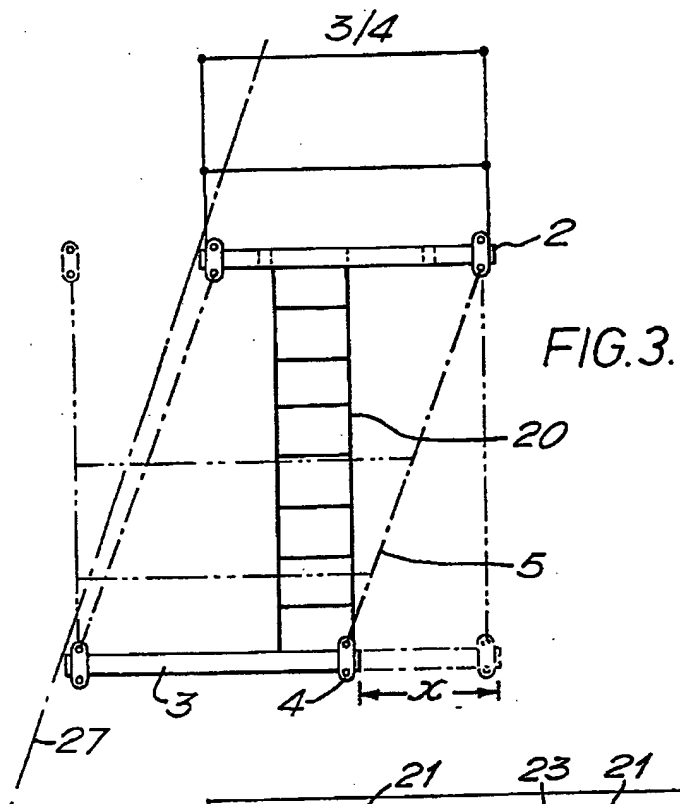
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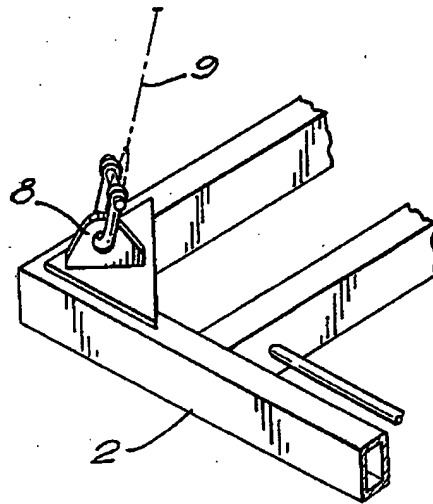


FIG. 5.

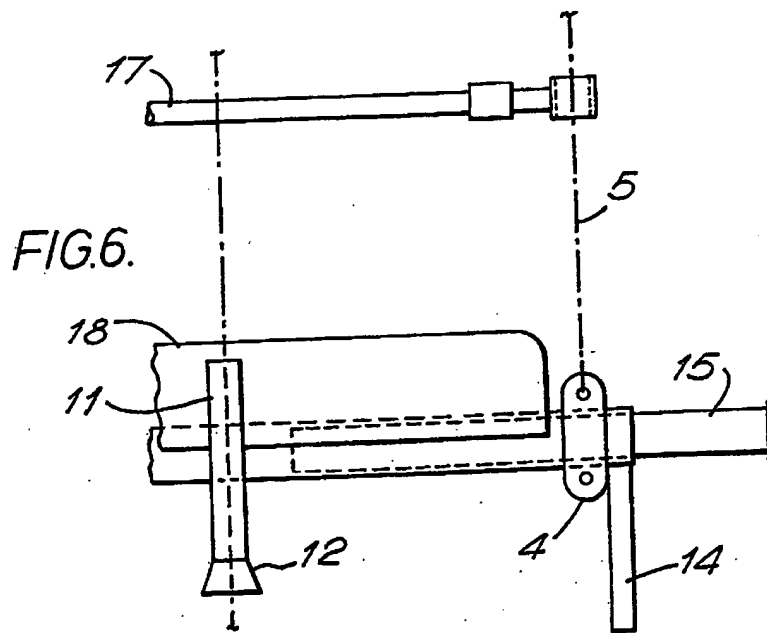


FIG. 6.

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SUSPENDED STAGING

5 The present invention relates to suspended staging
for use for example in marine applications, both onshore
and offshore. Such applications include ships,
semisubmersible vessels, tanks, hydrocarbon production
platforms etc. It also applies to civil engineering
10 applications.

Suspending staging generally comprises a series of
platforms interconnected by chains or cables so as to be
collapsible into a stack. To erect systems of this
kind, a crane is generally used to lift the staging and
15 locate it in position, whereafter operatives connect the
staging to fixing points above the top platform and
optionally beneath the bottom platform. The top fixing
operation can be difficult and hazardous, since the
chains by means of which the stack is carried by the
20 crane may have to be used for the permanent fixing.

Viewed from one aspect, an invention disclosed
herein provides a suspending staging system comprising a
top platform and a series of lower platforms, the
platforms all having link plates connected to
25 corresponding link plates on the adjacent upper and
lower platform by respective flexible elongate elements,
the top platform having additional attachment means for
connection to a crane or the like, whereby the link
plates of the top platform are connectable to a fixing
30 point on a structure while the stack is held suspended
from the separate attachment means.

There is thus provided a suspended staging system
which is sturdy in construction and which is both simple
and safe to erect.

35 Preferably the link plates are rigidly fixed to the
platforms, eg: by welding, and the flexible elongate
members comprise chains. Preferably the platforms are

rectangular and each has four symmetrically positioned link plates so that each platform is connected to an adjacent platform by four flexible elongate elements connected to the corresponding link plates on the adjacent platform. In one arrangement a rectangular platform has four link plates positioned two to each narrow side, adjacent the corners.

The additional attachment means on the top platform may take any suitable form, but preferably comprises a plurality of brackets fixed to the top platform. In one arrangement four brackets are welded to the top platform, one at each corner.

The platforms are all preferably provided with a guide at each end through which a cable or the like passes. The cables are preferably attached to the bottom platform and may be used to raise this and other lower platforms successively by winding the cables e.g. from the top platform. The guides may be arranged to engage when the stack is collapsed in order to render the collapsed stack more stable. Additional means may be provided for spacing the platforms from each other in the collapsed stack and for supporting the weight of the platforms.

Each platform may be provided with one or more arms arranged to extend from one side to contact the surface of a structure, particularly for use with structures having a surface which is recessed or where there is an overhang such as may be found on a ship or other vessel. Such arms may be extensible to a selected position.

The platforms are preferably provided with safety hand rails around their perimeter and removable "kick flats" or protective plates running along the edges. Removable hand rails may be mounted on the chains between adjacent platforms. These may comprise four lengths of tubing or tubes and four corner pieces which are connected to the chains and to which the tubes are removably connected. The top platform may have hand

rails which are permanently rigidly fixed in position or are collapsible, and which are independent of any chains connecting the top platform to the fixing point or suspending the stack from the attachment means.

- 5 The platforms preferably also include hatches and ladders extended between adjacent platforms to enable safe movement between platforms. Such ladders are preferably collapsible.

- 10 In addition to conventional use of the staging system as scaffolding, the system may be used as an escape or evacuation apparatus e.g. on offshore installations such as oil rigs and semi-submersible platforms. In such a case, the staging is preferably stowed or kept located in position in its retracted
- 15 condition. When required, it is simply lowered e.g. by gravity to the required level which may be below water level. Stabilisation may be by means of a weight at the bottom. This would then provide a descent tower.

- 20 Optionally, the staging might incorporate sheeting (e.g. of Neoprene) to surround the stack or tower in order to protect users from the elements. The system may also incorporate a water sprinkler system to cool the immediate atmosphere and/or the sheeting. This could then provide a controlled environment for descent.
- 25 Users could transfer from the staging either direct to a rescue vessel or perhaps to an intermediate inflatable floating platform.

- 30 Difficulties are encountered with known suspended staging systems when they are used in applications where a structure is inclined to the vertical e.g. against the curved side of a ship in which the platform may be displaced horizontally relative to one another.

- 35 Viewed from one aspect an invention disclosed herein provides a suspended staging system comprising a series of vertically spaced platforms capable of relative horizontal movement, at least some of the platforms being provided with ascent and/or descent

means providing access between vertically adjacent platforms, each ascent and/or descent means being mounted on at least one of two vertically adjacent platforms, and the mounting providing for lateral movement of the ascent and/or descent means relative to such platform.

There is thus provided a system which is particularly well adapted for use in applications e.g. against an inclined surface, where successive platforms are laterally displaced from each other. The point of suspension of a ladder can be laterally adjusted so that it is directly vertically above the adjacent lower platform despite a lateral displacement of the lower platform. Otherwise, with significant displacements a fixed ladder or other ascent/descent means might not be positioned over a platform floor.

Any means of laterally adjusting the point of suspension of a ladder may be used. However, preferably a ladder is slidably engaged at its upper end with a platform for sliding lateral adjustment relative thereto.

Preferably locking means are also provided for locking a ladder in a selected lateral position. In one arrangement in which a ladder is slidably mounted on a rod, the locking means comprise locking pins adapted to extend through apertures in guide sleeves mounting the ladder to the rod and engage with laterally spaced apertures on the rod.

Such guide sleeves and rod may provide hinge means whereby a ladder may be hingedly attached at its upper end to a platform. Such a ladder may be provided with a roller at its lower end for engagement with the adjacent lower platform, to enable it to be easily collapsible as the staging is stacked and unstacked. This is a particularly simple and robust arrangement and allows flexibility in the case of movement between platforms.

The ascent means may be a ladder provided with

rungs, but could also be e.g. a step ladder provided with deeper steps. The platforms may or may not be provided with hatches providing access to e.g. the ladders, depending on the application. Furthermore, in
 5 some applications it may be appropriate for some of the ladders extending between platforms to be permanently fixed in position and others to have an adjustable point of suspension.

An embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings wherein:-
 10

Fig. 1 shows a perspective view from above and to one side of a suspended staging when collapsed;

Fig. 2 shows a perspective view of the suspended staging of Fig 1 when deployed;
 15

Fig. 3 shows a schematic view from one end of two platforms positioned against a vertically inclined structure;

Fig. 4 shows a detailed view of the top and bottom of the ladder of Fig 4;
 20

Fig. 5 shows a detailed perspective view of a corner of a platform showing attachment means, with some parts omitted for clarity; and

Fig. 6 shows a detailed view from one end of a part of a platform.
 25

Figs 1 and 2 show a suspended stacking system 1 in a collapsed mode and a deployed mode respectively. There is shown a top platform 2, below which are connected a series of lower platforms 3. Each platform
 30 is rectangular and has two link plates 4 welded to each narrow side. The link plates are each formed with two holes for attachment to chains 5,6, shown in Fig. 2. Four chains 5 connect each lower platform to the adjacent upper platform, each chain 5 being connected at
 35 either end to the corresponding link plate on each platform. The top platform 2 is connected by four chains 6 attached to respective link plates to a fixing

point 7 comprising two brackets fixed to the side of a structure (not shown).

The top platform 2 is additionally provided with four attachment members comprising a bracket 8 located at each corner, by means of which the staging can be suspended independently of chains 6 and the link plates 4 on the top platform. The collapsed staging is shown in Fig. 1 suspended by brackets 8 through cables 9 from a crane 10. The link plates 4 on the top platform of the staging shown in Fig. 1 are thus free for attachment to chains 6 which allows relatively easy fixing of the staging to the fixing points 7. The brackets 8 are shown in greater detail in Fig. 5.

Each platform is also provided along each narrow side with a guide 11 which is generally cylindrical and has a flared portion 12 at its lower end, shown in greater detail in Fig. 6. When the staging is collapsed an upper region of each guide is received within the flared portion 12 at the lower end of the corresponding guide on the adjacent platform, so as to assist in stabilising the collapsed structure. Two hoist cables 13 are attached to the bottom platform and extend up each narrow side of the stack through the guides on respective narrow sides of each platform. The hoist cables 13 provide means whereby successive platforms can be raised to collapse the stack to the position shown in Fig. 1, or can be used to control the lowering of the platforms under gravity to the position shown in Fig. 2. Spacers 14 are provided at each corner of a platform to space the platforms from each other when collapsed.

The platforms are each provided along one broad side with arms 15 which are extensible as shown in Fig. 6 to contact the side of a surface which may be recessed. For safety each platform is also provided around its perimeter with hand rails 16, 17 and kick flats 18. The hand rails 16 on the top platform are permanently welded in position and the hand rails 17

above each lower platform 3 are releasably mounted to the chains 5 between each platform.

Each platform 2,3 is provided with a trapdoor 19 and a ladder 20 extends between each adjacent platform to allow personnel to move between platforms e.g. to descend in an escape situation. Each ladder is provided with rungs, but could also be provided with steps and possibly a hand rail. Each ladder is provided with two hollow cylindrical guide sleeves 21 at its upper end which are mounted on a cylindrical rod 22 below each platform, as shown in Figure 4. The guide sleeves 21 are slidable along rod 22 to adjust the lateral position of the ladder i.e. the spacing of the ladder between the broad sides of the platform. Each guide sleeve 21 is provided with an aperture and the rod 22 is provided with laterally spaced apertures (not shown). Pins 24 are adapted to extend through aperture 23 in each guide sleeve and to engage in selected apertures in the rod 22 to lock the ladder in a selected lateral position with respect to the platform. Each pin 24 is attached to the ladder by a short chain 25 to avoid its loss.

The guide sleeves 21 and rod 22 also act as hinge means, and the ladders are each provided with a roller 26 at their lower end for engagement with the adjacent lower platform. This arrangement enables the ladders to be collapsed with the staging and easily deployed, and also allows flexibility if there is movement of one platform with respect to another.

The staging system is shown in use against the inclined surface of the side 27, of a vessel in Fig. 3. The bottom platform (not shown) is connected to the vessel so that the stack is also inclined to lie against the side 27 and each platform is laterally displaced by a distance "x" from a position (shown dotted) directly vertically below the adjacent platform. The ladder 20 has been slid along rod 22 so that it overhangs the adjacent lower platform to allow a safe ascent or

descent. If the ladder 20 was permanently fixed in position there would be a risk that it would not directly overhang the lower platform.

5 The illustrated staging system is suitable for use as an escape situation, in which case it may be permanently deployed or stored in the collapsed state as shown in Fig 1. In marine applications the bottom platform might be attached to a floating platform from which personnel could be evacuated. The illustrated
10 system is also suitable for use in marine, civil engineering and other non escape situation which require the use of staging. It is to be appreciated that the illustrated embodiment is by way of example only.

CLAIMS:

1. A suspended staging system comprising a top platform and a series of lower platforms, the platforms
5 all having link plates connected to corresponding link plates on the adjacent upper and lower platform by respective flexible elongate elements, the top platform having additional attachment means for connection to a crane or the like, whereby the link plates of the top
10 platform are connectable to a fixing point on a structure while the stack is held suspended from the separate attachment means.
2. A suspended staging system as claimed in claim 1
15 wherein the link plates are rigidly fixed to the platforms.
3. A suspended staging system as claimed in claim 2 wherein the link plates are welded to the platforms.
20
4. A suspended staging system as claimed in any of claims 1 to 3 wherein the platforms are substantially rectangular and are provided with two link plates on each narrow side adjacent the corners of the platform.
25
5. A suspended staging system as claimed in any preceding claim wherein the attachment means comprises one or more brackets fixed to the top platform.
- 30 6. A suspended staging system as claimed in claim 5 wherein an attachment bracket is welded to a rectangular top platform at each corner.
7. A suspended staging system as claimed in any
35 preceding claim wherein guide means are provided on each platform for guiding a cable attached to the bottom platform to raise that and successive lower platforms,

the guide means being arranged to engage with guide means on an adjacent platform when the stack is collapsed.

- 5 8. A suspended staging system as claimed in any preceding claim wherein one or more extensible arms are provided adapted to extend from one side of the platform to contact a structure in use.
- 10 9. A suspended staging system as claimed in any preceding claim wherein the platforms are provided with safety hand rails and kick plates extending around the perimeter thereof.
- 15 10. A suspended staging system as claimed in any preceding claim wherein each platform is provided with a hatch or trapdoor and collapsible ladders are arranged to extend between adjacent platforms.
- 20 11. A suspended staging system comprising a series of vertically spaced platforms capable of relative horizontal movement, at least some of the platforms being provided with ascent and/or descent means providing access between vertically adjacent platforms,
25 each ascent and/or descent means being mounted on at least one of two vertically adjacent platforms, and the mounting providing for lateral movement of the ascent and/or descent means relative to such platform.
- 30 12. A suspended staging system as claimed in claim 11 wherein the ascent/descent means is a ladder or a series of steps.
- 35 13. A suspended staging system as claimed in claim 11 or 12 wherein the ascent/descent means is slidingly engaged with a platform from which it is suspended.

14. A suspended staging system as claimed in any of claims 11 to 13 wherein locking means are provided for locking ascent/descent means in a selected lateral position.

5

15. A suspended staging system as claimed in any of claims 12 to 14 wherein a ladder is suspended by means of guide sleeves slidably mounted on a rod below a platform and wherein locking means comprise pins adapted to extend through apertures in the guide sleeves to engage in spaced apertures in the rod.

10

16. A suspended staging system as claimed in any of claims 12 to 15 wherein a ladder is hingedly connected at its upper end to a platform and roller means are provided at lower end thereof.

15

17. A suspended staging system substantially as hereinbefore described with reference to the accompanying drawings.

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